

cattle with an attenuated virus as a protection against anthrax. Knowledge as to these subjects is shown in the address to be rapidly increasing, but it is maintained that the science of the prevention of disease advances quite as rapidly as the knowledge relating to its causation. Thus, the application of systems of sewers is shown by statistics to have led to a great decrease in enteric or typhoid fever, both in this and other countries, and it is rightly contended that where a similar result has not followed on such provision, defective and faulty methods of construction, and not the systems as such, must be held responsible. The improvement in the water-supplies for our towns and villages has in like manner led to much saving of life and health, but dangers still lurk even in our modern systems of supply, and some of them are extremely difficult of detection. As to this subject Captain Galton says he is disposed to think that there has never been a well-proved case of an outbreak of disease resulting from the use of drinking water, where the chemist would not unhesitatingly on analysis have condemned the water as an impure source. The inference here implied must unquestionably be regarded as considerably in advance of that which our more eminent chemists themselves would lay claim to. Indeed, Dr. Frankland has distinctly admitted that chemical analysis is unable to detect those small quantities of morbid matter which are capable of conveying disease, and he has himself mingled choleraic dejecta with water without being able to detect any noteworthy chemical alteration in its quality. The standard which should be aimed at in this matter of water-supply is the same as that advocated by Captain Galton in other matters such as sewerage, ventilation, &c., and that is to get rid of all conditions involving risk, rather than to hope that their influence for mischief may never have opportunity for manifesting itself. The address gives many instances, whether in connection with Indian fairs or elsewhere, to show that scrupulous cleanliness should be the aim of sanitarians, and this is at least as desirable in connection with water services and water-courses as elsewhere.

The address having been delivered at Newcastle-upon-Tyne, it was but natural that frequent reference should have been made to sanitary administration in that borough, and to the results attendant upon it. The need for the isolation of infectious diseases is a matter of public concern, which called for and received attention, and it is satisfactory to note from the recently issued Report of the Medical Officer of the Local Government Board, that a considerable proportion of the sanitary authorities in England have already recognised the necessity for making some provision for the removal of the infectious sick from amongst crowded communities. But it is also evident that the accommodation provided should be of an efficient character. At Newcastle there is hospital provision for the infectious sick, but we fear that even whilst the Congress is sitting, the inadequacy of the accommodation available there is causing anxiety to those who are responsible for the health of the borough. The extension of sanitary hospitals to every part of the kingdom is much to be desired, and the suspicion of their possible influence for evil which is adverted to in the address, need not in any way hinder action in this direction. The only disease which has ever been alleged to extend from such hospitals to the surrounding neighbourhoods is small-pox, and even that disease is not suspected of having any such influence except when a large number of patients are aggregated together. The very essence of these hospitals is to have them in actual readiness, so that first attacks being at once isolated any further spread is prevented; and if by any chance this becomes impossible, it is, to say the least, doubtful whether, the disease having once extended, we have not in vaccination an even more potent method of prevention than isolation can at such a stage afford. The compulsory notification of infectious diseases will some day come

powerfully to the aid of isolation as a measure of prevention, but public opinion as yet hardly appears ripe for any general measure to that effect.

In the concluding portion of his address Captain Galton endeavoured to convince his audience of the truth of the aphorism that public health really means public wealth. The advantages of dealing efficiently with the refuse of the population by sewage farms and otherwise was pointed out, and some of the results indicated went clearly to show that after all filth is but matter in a wrong place. The saving of life and health amongst persons inhabiting our model dwellings and improved lodging-houses was also shown to be striking, and it needs but little argument to prove that a distinct pecuniary advantage accrues to the community which can, by providing proper dwellings for the poor, retain amongst them, and in health, the bread-winners of each family. A large death-rate always means a heavy sick-rate and an increased poor-rate, and there is no form of death-rate which indicates a greater loss to a district than that which results from those infectious diseases which find their victims amongst the youth and adult members of the population. Fortunately it is these diseases above all others which are most easily prevented by the adoption of an intelligent and efficient sanitary administration.

### NOTES

WE regret to have to record the death, at the age of forty-three years, of M. Georges Leclanché, the inventor of the oxide of manganese constant elements, which are used so largely all over the world.

DR. OSCAR DICKSON has purchased and presented to the Botanical Museum at Upsala the magnificent collection of Scandinavian mosses and algae which the two Swedish naturalists, Messrs. J. and C. Hartman had collected during sixty years. The three botanical collections which form the basis for the study of the Scandinavian flora, viz., the Fries, Hahlenberg, and Hartman are now, by this last donation, in the possession of the University of Upsala.

THE inauguration of the Becquerel statue took place on Sunday at Chatillon-sur-Loing, a small country town of the Montargis arrondissement, in the department of Loiret, where the eminent electrician was born in 1788, and where his family are still living. The statue represents Becquerel holding in his hands the small apparatus of which he made use for producing by electrical agencies his artificial crystals. On the pedestal is carved the names of the principal battles which Becquerel fought when in the French army, which belong mostly to the campaign of 1813, especially the siege of Saragossa. M. Cochery, the Minister of Postal Telegraphy, who is the representative of Chatillon-sur-Loing in the French Lower House, delivered the inaugural speech—an eloquent address, summarising the principal discoveries of Becquerel, and insisted on the services rendered by him to the cause of telegraphy. M. Dumas, the President of the Committee for erecting the statue, having been unable to attend the meeting, sent a written address, which was read on his behalf by M. Daubree, Director of the School of Mines. In this eloquent address the Perpetual Secretary of the Academy of Sciences presented a picture of the results obtained by modern industry and drew a most ingenious parallel between the Greeks and Romans erecting statues to demigods, and the modern nations conferring the same honours on the real benefactors of mankind. He eulogised Guillaume, the eminent artist, whose masterpiece was offered to the inhabitants of Chatillon to commemorate the life of a great man. M. Fremy advocated the cause of the Museum. He reminded the audience that just fifty years ago the lectureship occupied by

Becquerel had been created expressly for him, in accordance with a recommendation of the Academy of Sciences. To give a proof of the exceptional activity exhibited by Becquerel up to the age of ninety years, M. Fremy stated that he had published during his life not less than 529 works or papers in scientific periodicals. M. Barras, Perpetual Secretary of the French Agricultural Society, reviewed the services conferred by Becquerel by his works on agriculture. M. Berthelot, a member of the Municipality, returned thanks to the *savants*, and the proceedings terminated by a banquet given to the scientific guests by the Becquerel family. All the speakers made allusion to the merits of M. Becquerel the younger and of his son, now *répétiteur* to the Polytechnic School.

THE burthen of the address of Mr. Woodall, M.P., in the Education Department of the Social Science Congress at Nottingham, was that without science in our systems of education, our industries are bound to wane before those of other countries where a scientific system of technical education exists. He showed what is being done in Germany and France in this respect, and how much headway we have to make before we can reach the standpoint of these countries. In this department Mr. Rowland Hamilton read a paper on the endowment of research. "As to the endowment of the more special forms of research as more commonly understood," he said, "there is hardly any limit which it is desirable to assign to it provided due assurance is given that the work desired is efficiently carried out. The services thus rendered are pre-eminently of general and national importance, and must be provided for by national expenditure. The economic doctrine of supply and demand as regards the interchange of individual services is wholly inapplicable to the question. The difficulty lies in the administration of the funds devoted to such purposes so as to insure that they are given to those duly qualified to use them. The method of State grants in aid, dispensed through the agency of existing societies and learned bodies who have earned a title to public confidence, might be largely developed with the greatest advantage and the relative functions of the Government and of such societies in their relation to this subject were discussed. The multiplication of 'idle fellowships' had a demoralising tendency. While any undue interference on the part of the central administration was to be altogether deprecated, it was essential to reserve to the State an ultimate and *quasi* judicial control, which would best secure that publicity and definite responsibility which are the best safeguards against abuses in any direction." In speaking on the subject of technical training Mr. Hamilton remarked that it was not necessary to teach special crafts in primary schools, but it was most desirable that a general scientific groundwork in technical knowledge should be included in a system of national education.

THE Iron and Steel Institute meeting at Vienna has evidently been a great success. Several subjects of great manufacturing importance have had the benefit of being discussed by men experienced in various methods; and the hospitality towards the English visitors has been profuse.

WHEN Admiral Mouchez received the news of the observations made by Thollon of the new comet he telephoned it to the Havas agency, and it was telegraphed by them to every paper in France. This is the first time that this organisation has been used in France for scientific purposes, and for the future it will be employed for any notable celestial occurrence.

WE are pleased to learn that the result of the letter which appeared in our columns a few weeks ago has been that a short course of popular science lectures has been planned, to be given on Friday evenings at the Victoria Hall, Waterloo Road. If this experimental course is successful it is proposed to extend it.

Admission is one penny (or threepence and sixpence for balcony seats), and the hall will seat 2500.

MESSRS. KEGAN PAUL, TRENCH, AND CO. will shortly add to the International Scientific Series, translations of Ribot's work on "Diseases of Memory, an Essay in the Positive Psychology," and of N. Joly's work on "Man before Metals." These will be followed by Mr. Robert H. Scott's "Elementary Meteorology," and Prof. Sheldon Amos's "Science of Politics."

WE have received three new parts of the "Encyclopædia der Naturwissenschaften," published by Trewendt, of Breslau—parts 5 to 7 of the second division. Part 5 contains the continuation of Kenngott's Word-book of Mineralogy, Geology, and Palæontology; in this we find two specially interesting articles by Lasaulx—on Continents and Delta Formations. In the 6th part we have the Word-book of Chemistry by Ladenburg and Collaborateurs. One of the leading articles in this part is that on Alkaloids, by Jacobsen, of Rostock. The 7th part is devoted to Pharmacological Botany, by Wittstein.

"THE Tropical Agriculturist" is the title of a monthly record of information for planters of coffee, tea, cocoa, cinchona, india-rubber, sugar, tobacco, cardamoms, palms, rice, and other products suited for cultivation in the tropics, published by Messrs. A. M. and J. Ferguson, of Colombo. Haddon and Co. are the London agents.

AFTER an address by the President, Mr. Shadworth H. Hodgson, LL.D., on October 9, and a paper on Spinoza on October 23, the Aristotelian Society propose devoting the meetings in November and December to a series of papers on the relation of Leibnitz and Wolf, and Locke, Berkeley, and Hume, to Kant. In January the Society will commence the study of Kant's *Critic of Pure Reason*, which will raise for discussion the validity of the primary concepts of science, and which will occupy the remainder of the session. The meetings will be held at 8, John Street, Adelphi, at 7.30 p.m. Particulars may be obtained from the Honorary Secretary Dr. A. Senior, 1, Bloomsbury Square, W.C.

IT is estimated by Prof. Dufour (*Arch. des Sciences*) that in a disastrous hailstorm on August 21 last year, about 100,000 cubic metres of ice fell in the district of Morges alone in a few minutes, and probably more than 1,000,000 cubic metres in the whole canton de Vaud that afternoon. Yet this is a small matter compared with the terrible hailstorm of July 13, 1788 (regarding which he makes some calculations). He gives some interesting facts, which seem to have been overlooked, in the history of *paragrêles*, or hail-preventers. Old men in the Canton de Vaud remember such apparatus, of lightning-rod character, being set up in several vineyards in 1825; the object being to hinder the formation of hail, by withdrawing electricity from the clouds. A hailstorm in July 1826 devastated, it is said, the best protected vineyards, and the *paragrêles* were then removed. Yet it was on receipt of encouraging and credible testimony from Italy and France (Prof. Dufour shows by extracts) that this brief experiment was made. Considering the distance of hail-forming clouds from the highest *paragrêles*, it is difficult, the author considers, to admit an influence of such apparatus; yet it must be remembered that electricity is "*un véritable fluide à surprises*"; often showing new and unexpected properties. Lately it is said to have been observed in some Swiss cantons, that showers of hail are more rare near forests than in unwooded districts. Prof. Dufour notes this as a matter calling for investigation. A forest may be regarded as a collection of *paragrêles*, and should it be proved to have the influence referred to, the theories which prevailed in 1824 and 1825 would gain new support.



At a recent meeting of the Franklin Institute it was shown by Mr. Grimshaw that the microscope may be of good service in estimating the value of structural material. It may determine whether or not the material is good enough to warrant trial with the testing machine. The author produced photographs of a chip of timber from a highway bridge that was wrecked two years ago, after a few days of service, through the strain caused by an empty truck; and the poor character of the wood was at once apparent. Such micro-photographs of timber, in fact, show that in the strong specimens, the concentric rings are close in texture and of slight width, and the radial plates frequent, wide, long, and thick, while the reverse is found in the poor material. As a parallel in metal-work, Mr. Grimshaw exhibited two portions of pure Lake copper, one an ordinary ingot, of coarse and crystalline grain, dark red colour, and full of blow-holes; the other, cast with proper precautions against oxidation, the grain close and fine, the colour salmon, and no blowholes. Tests of tensile strength of sheet and wire from these materials strikingly confirmed the indications of the microscope.

THE *Journal* of the Franklin Institute for September contains a fine plate (produced by the phototype process invented by Mr. Jacobi, of Neuendorf-Coblentz), representing the great bell of Moscow, from a photograph recently taken by Mr. Nystrom, who gives some interesting information about the largest ringing bells in the world.

AN attempt has been made by Signor Serpieri to connect, in an indirect way, two very dissimilar phenomena, viz., the attraction of the sun and moon, and the periodical revival of vulcanism in its more common manifestations. He finds support for his view (*Reale Ist. Lombard.*, August 3) in a recent observation by M. Daubrée in the deep gallery (for the Channel tunnel) made in the Rouen chalk, where it was noticed that the pits showed oscillations of level quite concordant with the varying tide above, the water abundant at high tide, and scanty at low tide; which is easily understood (says M. Daubrée), since all aquiferous strata there pass under the sea. Accepting this variation in the water of terrestrial depths with the sea-level, and knowing, on the other hand, that sea water has a principal part in the activity of volcanoes (as proved by the nature of their products and the immense quantity of aqueous vapour, which cause and maintain eruptions), it is natural, Signor Serpieri says, to conclude that the volcanic activity must present phases agreeing with those of the tide, and thus there appears a certain connection with the age and the position of the moon. Observations of a large number of earthquakes should also present the relation in question, as these are known to be mostly of volcanic origin, and to preferably affect coast regions; and M. Perry observed they were more frequent at syzygies and perigee of the moon. Prof. Bombicci has also observed in some parts of Italy a greater frequency of earthquakes at times of heavy and prolonged rains, which he regards as the exciting cause in such cases; and precisely because not all seismic centres are fed with sea-water, it is vain to expect that the luni-solar influence on earthquakes may be always made out. Thus the anomalies recorded by Schmidt and others may be explained.

THE additions to the Zoological Society's Gardens during the past week include a Rude Fox (*Canis rudis*) from Demerara, presented by Mr. W. F. Bridges; three Common Hedgehogs (*Erinaceus europæus*), British, presented by Mr. W. Bayes; two Chimachima Milvagos (*Milvago chimachima*) from Demerara, presented by Mr. G. H. Hawtayne, C.M.Z.S.; a Common Barn Owl (*Strix flammea*), British, presented by Mr. G. Paul; a Purple-headed Glossy Starling (*Lamprocolius auratus*) from West Africa, presented by Mr. J. Biehl; a Radiated Tortoise (*Testudo radiata*) from Madagascar, presented by Capt. R. Elwood; a Blue-crowned Hanging Parrakeet (*Loriculus galgulus*) from

Ceylon, deposited; a Polecat (*Mustela putorius*), British, a Bengal Pitta (*Pitta bengalensis*) from India, purchased; four Banded Grass Finches (*Poephila cincta*), bred in the Gardens.

## UNWRITTEN HISTORY, AND HOW TO READ IT<sup>1</sup>

### II.

BUT the flint arrow-heads and scrapers, and the use of stone for battle-axes, carry us back to a still earlier chapter of unwritten history, when, for want of knowledge of bronze or any other serviceable metal, our predecessors, like many a savage people of recent or comparatively recent times, had to make use of such materials as readily came to their hands—like stone, wood, and bone—for all ordinary appliances. With relics of this period, which, so far as those made in stone are concerned, are almost imperishable, the soil of this country in many districts abounds. We also find the tools and weapons of this Stone Age in many of the grave-mounds or barrows and beneath the floors of some of our caverns. It is by means of these relics that the history of this period is to be read, but here also much is to be learnt from the early lake-habitations of southern Europe and from the habits of savages in other lands who are unacquainted with the use of metal. It is indeed somewhat remarkable that those in so low a stage of civilisation should have been able to furnish themselves with so many and such perfect appliances made of stone. Not only do we find hatchets and adzes of flint and other hard stones, with their edges carefully ground, but chisels, and even gouges or hollowed chisels (though these are rare in Britain), drills or awls, hammers, knives, saws, and scraping tools of various kinds. One of the most common of these is made from a flat splinter, or flake of flint, trimmed at the end to a semicircular scraping edge. We still find such tools in use for the purpose of preparing skins; and we have corroborative evidence of their having been in use in old times for some such purpose, in the fact that the semicircular edge is often worn away and rounded in precisely the way that would result from its being used to scrape a soft but gritty substance, such as leather exposed to dust and dirt. Though skins probably formed the principal clothing, the presence of spindle-whorls—the small fly-wheels by which spinning by hand is carried on—in some settlements of the Stone Period, proves that the art of spinning was not unknown, and indeed charred fragments of woven linen cloth have been found in some of the lake dwellings of this age. The stone-using people of that time cultivated wheat, barley, and millet for their bread, which they ground into coarse flour by means of rubbing-stones; they flavoured their cakes with caraway and poppy seeds, and laid up stores of nuts and walnuts, beech-mast and acorns, apples and pears for winter use, and ate all the common wild fruits in their seasons.

All this we learn from the charred remains left at the bottom of the lakes where the pile-dwellings were burnt down. The bones thrown away show that not only did they hunt wild animals of the country, but that they had oxen, sheep, and goats, and probably also pigs, as domesticated animals, and the dog was already their faithful companion. Their weapons for the chase were arrows and spears tipped with flint—the former of which, being cheaper than metal and also liable to be lost, remained in use even when bronze was known. They also possibly made use of the sling. Their axes, like modern tomahawks, seem to have been used both for peaceful and warlike purposes, but in this country at least it is doubtful whether any of the stone battle-axes with a hole for the haft belong to an earlier date than the simplest of the bronze daggers. From an examination of the skulls and bones found in the graves of the Stone and Bronze Periods we are able to form an idea of the size of the men of those days, and of the differences between them. From the objects buried with them we can even form some idea of their religious beliefs and hope of a future state. I must not, however, dwell on the details of these chapters in the unwritten history of man in Britain. I may, however, observe that though we may fix within some centuries the date when bronze began to be employed for cutting-tools, and stone in consequence began to fall in disuse, we are as yet at a loss to say at how early an epoch the use of the stone hatchets with

<sup>1</sup> A lecture to the working classes, delivered at the meeting of the British Association for the advancement of science, held at Southampton, August, 1882, by John Evans, D.C.L., LL.D., F.R.S., &c. Revised by the Author. Continued from p. 516.